MAGENDIE (F.)

Physiological and Chemical Researches

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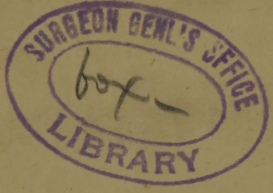

RECOMMENDATION.

BEING requested to give our opinion of the merits of Dr. MAGENDIE'S writings on the Prussic Acid, we state, that, in our view, his researches are very valuable, and worthy of being repeated and extended; and that his account of his own experiments, and of those of other enlightened physicians in various countries, is perspicuous, and bears every mark of accuracy and faithfulness.

ELI IVES, *Professor of Materia Medica and Botany—Yale College.*

BENJAMIN SILLIMAN, *Professor of Chemistry, Pharmacy, Mineralogy and Geology,—Yale College.*

NEW-HAVEN, June 16, 1820.

13

PHYSIOLOGICAL

AND

CHEMICAL RESEARCHES

ON THE USE OF THE PRUSSIC OR HYDRO-CYANIC ACID IN THE TREATMENT OF DISEASES OF THE BREAST,

AND PARTICULARLY IN

PHTHISIS PULMONALIS;

BY F. MAGENDIE, M. D. &c.

TRANSLATED FROM THE FRENCH, WITH NOTES, &c.

BY JAMES G. PERCIVAL, M. D.

NEW-HAVEN:

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PREFACE OF THE AUTHOR.

Senac, the illustrious author of the Treatise on the structure of the heart, says, in the preface to his admirable work, that medicine is a subject of delirium to most minds. Undoubtedly this learned physician meant to designate by this energetic phrase the strange, but general mania, of reasoning on medicine without having acquired the first notions of it;—But he meant above all to point out that other mania no less singular but much more dangerous, according to which a physician should be a stranger to anatomy, and physiology, should neglect physics, chemistry, and the other natural sciences, and devote himself entirely to practice. This is almost like advising a blind-man to look well at objects to acquire instruction.

Is he not indeed blind who in approaching a patient, knows neither the structure of the body, nor the play of the organs, nor their material alterations; who is ignorant of the influence of physical agents on life, or perhaps even of the existence of these agents; who is no better informed about the chemical nature, and the physiological properties of the medicines which he employs? With no other merit but a stupid routine, masked

under the name of experience, he will have no means of perceiving the morbid phenomena which may pass before him, and what he shall be able to see will be equally within the reach of the vulgar.

This madness which Senac combated in his time by his example and his writings, is far from being entirely eradicated; many persons, otherwise very respectable, share it still, some recent publications consecrate it, certain schools resound with it, and its consequences, so favourable to idleness and pedantry, are received with eagerness by the multitude. It is however this absurdity which has always opposed the progress of medicine, which rejected for thirty years the discovery of the circulation of the blood, which made the Parliament condemn tartar emetic, and which long denied the febrifuge virtue of cinchona; which at this moment declaims against the utility of physiological experiments and the rational and restricted application of chemistry to medicine, and would even bring us back to the treatment of diseases by amulets, talismans, and magic words, for many diseases might be cured as well by these ridiculous means, as by some others now in favour.

All those who are interested in the happiness of man, and the progress of knowledge, should strive to eradicate this pernicious error. We cannot do it by reasoning alone; for what effect can the most severe logic

have on prejudiced understandings? But we ought to attack it by facts and material proofs which in time undermine and destroy the strongest prejudices.

My researches on tarter emetic, emetine and the salts of morphine; those which I have attempted on vomiting, the gravel, &c. have been made with this view.

The new labour which I offer to the public has been undertaken with the same intention.

ADVERTISEMENT.

The first part of these researches was translated in 1817, by Dr. Granville of London, and published in the Journal of Science and the Arts, No. VIII. The remainder has been recently published at Paris, and is now, so far as is here known, first given in an English dress. In addition a short introduction is given, containing a brief sketch of the history of the acid, and some notes added in an appendix, chiefly relative to the employment of the article as a medicine in the United States.

New-Haven, May, 18, 1820.

INTRODUCTION BY THE TRANSLATOR.

The prussic acid, although originally obtained by certain chemical processes from blood, has since been detected in several vegetable substances, particularly the bark, leaves and flowers of the prunus lauro-cerassus and other species of the same genus, in those of the peach and almond, in the kernels of the bitter almond and the peach, and in all the bitter kernels of the drupaceous fruits, in the pips of apples, &c. The odour of the prussic acid, prepared after the method of Scheele, was observed to resemble that of peach blossoms and laurel-water. Led by this indication, Bohn detected this acid in the distilled water of bitter almonds: Schroeder detected it in laurel water, by pouring this water on a salt of iron, then adding a few drops of an alkali, and any acid, except the nitric or nitro-muriatic; a blue precipitate of prussiate of iron was thrown down.

The peculiar properties of this acid in relation to the living body, were first observed in the laurel water. In 1733, Dr. Madden of Dublin, published in the Philosophical Transactions, the account of two women who were poisoned by it in 1728; one of them, who took two drams in an hour, lost the use of speech, felt a pain in her stomach,

and expired without vomiting, stools, or convulsions; the other took two table spoonfulls, she sat down in a chair, still conversing rationally and died immediately after, without convulsons or any other apparent commotion. Dr. Madden also mentions a young man, who died in a few minutes after having drank part of a vial of distilled laurel water; he experienced severe pains in the stomach. Influenced by these striking facts, many physiologists engaged in experimenting with the laurel-water on animals. Among the most distinguished of these experimenters, were Brown-Langrish and Fontana, and recently Orfila. The effects observed after administering it were vomitings, languor, convulsions, and tetanic stiffness of the muscles, the breathing accelerated, sometimes acute plaintive cries, the senses at first undisturbed, but the sight and hearing gradually diminished till death. On dissection the veins were found injected and the arteries empty. These effects were produced by introducing it into the stomach or rectum, and with the essential oil, prepared by dry distillation, Fontana destroyed rabbits, pigeons, frogs, &c. by administering three or four drops internally, or merely applying it to the mouth, the eye, or a fresh wound. It induced immediate paralysis, and death in half a minute.

After the resemblance in odour between the laurel-water and the prussic acid had

been observed, and particularly after the acid had been detected in the laurel water, physiologists employed the acid in the same course of experiments on animals, and with similar results. Given to dogs, in doses of two to sixteen drops, it produced staggering, vomiting, cough, salivation, weakness of the posterior extremities, opisthotonos, dilatation of the pupil, general stiffness, complete paralysis, accelerated pulse, convulsions of the eyes, subsultus tendinum. Sometimes, after these effects, they recovered, but a large dose produced immediate convulsions and death. In very large doses, death took place instantaneously, but attended with tetanic contraction of the muscles. The smaller doses of the acid and laurel water were observed to produce more violent convulsions, and the larger, instant paralysis and death. Powerful as these substances were found to be, another still more deleterious has been discovered: This is the pure prussic acid of Gay-Lussac, that of Scheele being largely diluted with water. For the effects produced by the pure acid, I refer to the memoir itself. I shall only observe, that Professor Scharinger, of Vienna, applied a quantity of the pure acid to his naked arm and died soon after. I will conclude this brief sketch of the deleterious properties of prussic acid, and those substances containing it, by giving the conclusions of Orfila, derived from

his own experiments and the observations of others:

1st. Prussic acid is hurtful to the different classes of animals, more to those which have warm blood than to the others.

2d. It produces death so much the more rapidly, as the circulation is more active, and as the organs of respiration are more extensive.

3d. It is more pernicious to young animals than to others.

4th. It exerts its action on whatever texture it may be brought in contact with, the nerves and dura mater excepted.

5th. The intensity of action varies according to the part to which it is applied; it is extremely deleterious when injected into the jugular vein, or into the trachea; less so when injected into the thorax; still less so when introduced into the stomach or rectum, and weaker still when applied to wounds; but death takes place sooner when the wound has been made in the anterior limbs.

6th. If the dose has not been sufficiently strong to cause death, the animal recovers very speedily, more especially if the poison has been brought in contact with the eye or the stomach.

7th. Its effects depend on its being absorbed and carried into the circulation.

8th. Its action is retarded, but not suspended, when it is brought in contact with a

part, which no longer communicates with the brain or spinal marrow.

9th. It appears to act on the human species, as on warm blooded animals.

10th. It destroys the irritability, and ought to be classed among the narcotics.

11th. It does not produce any inflammatory lesion capable of being demonstrated after death ; the venous system appears distended, the arteries empty, the pupils often dilated, the lungs spotted ; alterations common to a great number of the narcotics. In some cases of death by laurel-water and bitter almonds, the stomach was found slightly inflamed.

Although the prussic acid was first introduced into Medicine by Magendie, the laurel water and the other substances containing it had been long since employed in practice. The laurel-water has been used in some cases of phthisis pulmonalis, it is said, with advantage. It has been also employed in obstructions of the liver and schirrosities. It is said in small doses to give tone to the stomach and exhilerate. Mayer, of Naples, employed it in virulent gonorhea ; and its efficacy in this complaint has been tested, according to Thatcher, by an American captain, on his crew. Professor Wurzer found it useful in hypochondriasis and nervous affections, in the dose of fifty drops three times a day. It has been recommended by some German authors in hydrophobia. It is said

in these cases to retard the pulse, and diminish the irritability. The bruised leaves have been found useful as an emollient external application to painful tumours and ulcers.

Brown Langrish observes, that the laurel leaves had been employed in his neighborhood in the cure of intermittents. This observation is in some measure confirmed by the efficacy of the bark of the prunus virginiana in this disease. The mode of administering it, pointed out by him, was to give as much of the powdered leaves as would lie on a shilling, in a glass of white wine, two hours before the fit, repeating it three times. Bergius asserts, that bitter almonds are very efficacious in the cure of intermittents. He gave them in the following way; R. soluble tartar 1 dr. honey 1. oz. diffuse them in a pound of water, make with this water an emulsion with an ounce of bitter almonds, of this emulsion give during the intermission a pound or two every day; with this he cured the disease in some instances, and in others found it a useful auxiliary to the bark, in some cases even, which had resisted the use of the bark, he had seen this emulsion succeed in affecting a cure.

The prunus virginiana possesses similar properties in a very considerable degree. The distilled water of its bark and leaves is very poisonous, and the fruit is said to intoxicate birds; even brandy, in which this fruit has been infused, is said, in a quantity insuf-

ficient to intoxicate, to produce narcotic effects, such as languor, vertigo, nausea. The bark, particularly of the root, has been much used in medicine; it has been highly praised in the cure of intermittents. In pulmonary consumption it has been found useful by Dr. Chapman, in palliating the symptoms of hectic, relieving the cough, restraining the diarrhea, abating the sweats and increasing the general vigour of the system. It has been found useful also in cases of hectic from other causes, particularly psoas abscess. It has afforded relief in asthma and dyspepsia, and is said to have been useful in chronic dysentery, diarrhea and cholera infantum.

From the observations just related, it appears, that the lauro-cerasus, the bitter almond, and our own prunus virginiana, possess similar properties, and have been found useful in similar diseases, with the prussic acid. Experiments have shewn, that they all contain this acid, and it is no little confirmation of the truth of the observations contained in this work, that those natural substances, in which the acid is known to exist, should have been found useful in the diseases, in which M. Magendie and his friends have employed this interesting article with so much advantage.

Preparation of the Prussic Acid.

There are two methods of preparing this acid which have principally attracted the

attention of chemists, that of Scheele, and that of Gay-Lussac. Scheele discovered the acid in 1780: he prepared it from the prussiate of iron, which may be procured in the shops, or prepared after the following method; take three parts of blood evaporated to dryness in an iron dish, and mix it with one part subcarbonate of potash; calcine them in a crucible, which should be only two thirds filled by the materials and covered with a lid; the calcination must be continued with a moderate heat as long as a blue flame issues from the crucible, and when it becomes faint and likely to be extinguished, the process must be stopped; throw the mass when cold into ten or twelve parts of water; allow it to soak a few hours and then boil them together in an iron kettle; filter the liquor and continue pouring hot water on the mass as long as it acquires any taste; to this solution, add one composed of two parts of alum, and one of sulphate of iron, in eight or ten of boiling water, and continue the mixture as long as any effervessence and precipitation ensues; wash the precipitate several times with boiling water; it will have a green colour, but on the addition of a quantity of muriatic acid, equal to twice that of the sulphate of iron which has been used, it will assume a beautiful blue colour; wash it again with water and dry it with a gentle heat; this is the prussian blue or a mixture of prussiate of iron with alumine: from

this prussiate of iron the acid may be prepared by the process of Scheele in the following manner: mix two ounces of red oxyd of mercury, prepared by nitric acid, with four ounces finely powdered prussian blue and boil the mixture with twelve ounces of water in a glass vessel, shaking it frequently. Filter the solution, which is one of prussiate of mercury, and white lead, and when cool add to it in a bottle, two ounces of iron filings, and six or seven drachms of sulphuric acid; shake them together, decant the clear liquor into a retort, and distill off one fourth of the liquor. The distilled liquor is the prussic acid very considerably diluted with water. It has a sweetish taste, a smell like bitter almonds, does not redden vegetable blues, has not a strong affinity for alkalies, nor does it take them from carbonic acid; no effervessence arises on adding it to a solution of alkaline carbonates; it readily combines with pure alkalies, destroys their alkaline properties, and forms chrystallizable salts; these salts are decomposed by exposure to carbonic acid, even when highly diluted, as in atmospheric air.

Gay Lussac's Process.

Form prussiate of mercury by digesting prussiate of iron four ounces with red oxyd of mercury two ounces; this prussiate is decomposed by muriatic acid. Apparatus—a tubulated retort with a horizontal tube 2 feet

long luted to it; the first third of this tube contains pieces of white marble, to detain the muriatic acid, should any distill over, and the remaining two thirds contain fragments of fused muriate of lime to retain the aqueous vapor: a small receiver is adapted, surrounded with a freezing mixture or with ice: strong muriatic acid is used, and rather less than is wanted to decompose the prussiate of mercury; the prussic acid commonly condenses first on the marble: thence it is driven by a moderate heat and allowed to collect on the muriate of lime, whence it is dislodged again by heat and collected in the receiver.

Thus obtained, it is pure and free from water; it is a colourless liquid, highly adorant; taste at first cooling, then burning; highly sedative and poisonous; it boils at $81\frac{1}{2}^{\circ}$, freezes at 3°, and chrystalizes regularly; it congeals even at 68° by its own evaporation; though repeatedly rectified from marble it feebly reddens litmus, and the color is restored as it evaporates; it is very liable to decomposition, even when kept in vessels hermetically sealed; it sometimes decomposes in one day, and can rarely be kept over fifteen;—it becomes reddish brown, and if the vessel be not perfectly tight, eventually leaves only a charry mass. This great tendency to decomposition, renders it much less dangerous as a poison in the hands of the ill-designing, than it would be if it were permanent.

RESEARCHES

ON THE PRUSSIC ACID, PRESENTED TO THE ACADEMY OF SCIENCES, NOV. 17, 1817—TRANSLATED FOR THE JOURNAL OF SCIENCE AND THE ARTS, BY DR. GRANVILLE.

PHYSIOLOGICAL experiments are of the utmost importance in the practice of medicine. It is by means of them, that substances used as medicines on mere hypothetical principles are justly rejected, and the really active remedies better known, or more beneficially employed, by varying their proportions and mode of administration. Another great advantage resulting from physiological experiments, is the discovery of new remedies, which the physician is enabled to make by their assistance, and by directing his attention to substances already known, but either neglected or seldom used, as well as to those preparations which modern chemistry is daily bringing before us, and which, in the hand of an able and experienced practitioner, may become particularly useful to mankind.

It was on account of this firm persuasion, that I have ventured, at different periods, to call the attention of the Royal Academy of Sciences to the poisonous and medicinal qealities of the *Upas tieuté*, the *nux vomica*, the *supertartrate of antimony and potash*, and

the *ipecacuanha*. The favourable reception which my researches have met with, have encouraged me to proceed farther, and I shall have the honour this day of laying before the Academy the result of my enquires respecting the action of the prussic or hydrocyanic acid on the animal system, and the good effects which may be derived from it in the treatment of several diseases.

The prussic acid, discovered in 1780 by Scheele, was soon after reckoned amongst the poisonous substances; an opinion which was confirmed by the experiments made, both in Germany and France, by Messrs. Coulon, Emmert, Robert, Orfila, &c.—From their experiments, and from some which are peculiarly my own, it results 1st, that the prussic acid, whether liquid or in the state of vapour, is injurious to the life of all animals, and in many cases to that of vegetables; 2d. that death produced by this acid is much more instantaneous, from the circulation becoming more rapid, and the lungs more distended; 3d. that it acts on warm blooded animals by destroying ther sensibility and the contractility of the voluntary muscles; and would act in a similar manner on man, where the dose given is greater than what will be hereafter mentioned.

It cannot be denied, therefore, that the prussic acid is a very active poison; and yet all the experiments I have just now alluded to, have been made with the prussic acid of

Scheele, which contained a very considerable quantity of water, and was consequently very weak. From this circumstance it will be easy to conceive, that the effects of the *pure* acid, prepared according to Gay Lussac's directions, must needs be much more energetic. Its activity, indeed, is really frightful, even to those who are accustomed to witness the effects of poison. Of this the Academy shall judge by the following facts.

Experiment 1. The extremity of a glass tube which had been previously dipped into a phial containing some pure prussic acid,* was immediately plunged into the throat of a strong dog. The tube had scarcely come in contact with the tongue, than the animal made two or three long and rapid inspirations, and fell dead. No method we could devise enabled us, afterward, to trace the smallest sign of sensibility in the muscular organs of this animal after death.†

Experiment 2. An *atom* of the acid was applied to the eye of another strong dog; the effects were as sudden and as fatal as in the preceding experiment.

* In performing this experiment, it is better to employ the acid diluted with a certain quantity of alcohol, particularly if the temperature of the atmosphere is elevated; otherwise the evaporation is so speedy, that the tube becomes dry before it reaches the animal.

† Since I read this memoir to the academy, I have often seen traces of feeble irritability in animals, which had been poisoned by the pure prussic acid.

Experiment 3. A drop of the acid diluted with four drops of alcahol, were injected into the jugular vein of a third dog. The animal fell dead that instant, as if struck by *a cannon shot or by lightning.*

In short, the pure prussic acid, prepared according to M. Gay Lussac, is without doubt, of all the known poisons, the most active and the most promptly mortal. Its deleterious and powerful influence permits us to believe, what the historians have related of the criminal talent of Laucustus ; and renders the accounts of those extraordinary and sudden cases of poisoning, so frequent in the annals of Italy, less marvellous and incredible.

I must not omit to say likewise, for the sake of those who should feel disposed to make experiments with this substance, that the utmost caution is necessary ; as it is impossible to breathe its vapour without feeling the the most dangerous effects. Owing to some neglect on our part, in this respect, we have at one time experienced the most excruciating pain in the chest, accompanied by a feeling of insupportable oppression, which lasted some hours.

It might appear from all this that the pure prussic acid in the hands of one intent on murder, would become the instrument of crime, without fear of detection; but the public may make themselves easy on that score. More nicety of manipulation, and

dexterity in the operations of chemistry is required to procure this acid, than falls to the lot of common people; and even when properly prepared, it is almost impossible to preserve it in its state of purity, as I have ascertained by direct experiment. It is spontaneously decomposed at the ordinary temperature of the atmosphere, and then looses, in a short time, all its obnoxious qualities. Besides, though the prussic acid produces death, without any visible alteration of the animal organs, it is easy to detect a case of poisoning by it: for the body will exhale, during several days, a strong smell of bitter almonds.

Poisonous as it is, there is no doubt but that the prussic acid may, when properly diluted with water, be used as a medicine with safety. We know from the experiments which Mons. Coulon made on himself, that it may be given to the dose of sixty drops without producing any very serious inconveniance. Besides the pretty frequent use made in medicine of the laurel water, in which the prussic acid enters as a component principle, proves that it may be introduced into the stomach when properly diluted. Nothing, therefore, shows any impropriety in its use as a remedy; a circumstance which has already induced some French and Italian physicians to give it in various disorders. If their success has not been equal to their expectations, it is because they did not

seem sufficiently aware of its mode of action on the animal economy: and without this knowledge it is impossible to make a right use of any new remedy whatever.

In studying the phenomina of poisoning by prussic acid, I have often observed, that animals, in which no trace of sensibility, or muscular contractility could be found, would often continue to breathe for several hours freely, while their circulation, though much accelerated, remained apparently unaltered. These animals indeed might have been said to be dead with regard to their external functions, yet still enjoying life, through their nutritive faculties.

This property of extinguishing the general sensibility without any ostensible injury to the respiration and circulation, the two principal functions of life, induced me first to believe that the prussic acid might be advantageously used in cases where the disease seemed to owe its origin to a vicious augmentation of sensibility. From that moment I determined to use it whenever any such case should offer itself to my attention.

About three years ago I was consulted in behalf of a young lady aged 27, who for the space of eighteen months had been distressed by a dry short cough, which became stronger in the evening and in the morning. Alarmed at these symptoms, which seemed to indicate an affection of the lungs, her friends took the advice of several of the

most distinguished medical practitioners of the capital, who all prescribed the usual remedies in such cases, but without success. I ordered her six drops of Scheele's prussic acid, prepared by Pelletier, diluted with three ounces of vegetable infusion; to be taken by spoonfuls every two hours. The following day the cough had considerably diminished, and it disappeared entirely on the fourth.

The cough however having made once more its appearance six months afterward, I repeated the same remedy with an equal success.

Since then I have had repeated opportunities, but chiefly with young ladies, to employ the prusic acid in cases of nervous and chronic coughs: and have always obtained the greatest success, without having observed any inconvenience from it. In no case have I gone beyond the dose of *ten* drops taken at intervals during twenty-four hours, and diluting it with several ounces of some fluid vehicle.

Very lately I have succeeded in calming by this same means a convulsive cough, with which an elderly lady of a nervous temperament had been greatly affected, and which for six days previous to my seeing her, had come on by alarming fits, depriving her of all rest. I was so much the more willing to adopt in this case the use of prussic acid, as the patient could take neither opium nor any

preparation of popies without being grievously incommoded.

After thus having ascertained the efficacy of the prussic acid in the treatment of dry convulsive cough, I thought it was indispensable for me to inquire whether the same means might not be employed with success to combat the cough and other symptoms which overpower the unhappy consumptive —and whether it would not influence, or even suspend, the progress of pulmonary consumption.

The result of my trials has been favourable with regard to the first of these conjectures; and on fifteen persons, offected with phthysis, who had been placed under my care for the last three years, I have constantly found that the use of the prussic acid, given in small but repeated doses, diminished the frequency of the cough, moderated, and rendered more easy the expectoration, and lastly, procured the patients some sleep at night without any colliquative sweats. Those who are accustomed to follow the march and progress of phthysis, and witness the sufferings without number by which individuals attacked by this terrible malady are overpowered, will easily appreciate the real benefit of this success.

Since the beginning of the month of August last to this day (November) I have had many opportunities of studying the effects of prussic acid on a great number of phthisical

patients at the hospital of *la Charité*. Mons. Lerminier, physician to that hospital, in which such diseases are very frequent, has, at my request, agreed to administer the prussic acid in about twenty cases, at the dose of four drops properly diluted with water.

The greater number have shown evident signs of emelioration, and some seem much better at this moment. The cough is considerably diminished. The expectoration has become easy, and sleep came to shorten their sufferings. These improvements became more evident, where the disease was in an incipient state; a circumstance which is not difficult to explain, when it is considered, that the lungs are in a state of disorganization, in the second, and above all, in the third stage of consumption.

Yet as I wish to state merely, in this place, the *exact* effects of the prussic acid, I must avow that amongst the patients of *la Charité*, who have used it, some, whose disease was near its end, did not derive any very sensible benefit from it; and that in two instances, in which the patients had taken the acid at too short intervals, experienced some headach, and a kind of vertigo, which lasted some seconds. In a third case it was feared that the acid had proved injurious.

A young man aged 29 was admitted into the hospital towards the end of September last with all the symptoms of a confirmed

pthysis.* The acid was given in the dose of six drops only. The cough diminished the second day; but the oppression increased; the third day it became suffocating, though the acid had been discontinued the preceding day; and the patient fell into a sort of insensibility which terminated in a few hours in death. This could not have failed to raise some suspicions against the remedy, if the examination *post mortem* had not clearly shown, that the fatal termination of the malady was owing to an immense quantity of serous fluid found in the left side of the thorax; the heart being thrown to the right, and touching the ribs of that side. Neither the stomach nor the body exhaled any prussic smell. The disease in this case was in its second stage; but it was evidently not the principal disease by which the patient was affected, a circumstance which will account for the absence of all sort of beneficial results from the prussic acid.

In my private practice I never observed any bad effect to result from the action of the prusic acid given as I directed, which may be accounted for by considering the great care and attention which a patient in the bosom of his family receives at every moment;

* Contrary to the established practice of Mons. Lerminier, the chest was not explored by means of percussion, as generally done with all the patients who enter at *la Charite*. This prevented the discovery of an old inflamation of the pleura which affected the left side of the chest.

the case being necessarily different in regard to patients in even the best regulated hospitals.

From all that precedes I think I am warranted in concluding that the prussic acid, given in small doses, mixed with a certain quantity of water, may be advantageously employed as a palliative treatment of consumption, with a view of calming the cough, facilitating the expectoration, and procuring sleep; and that as such it must be considered as the first among the substances usually employed for similar purposes; as it does not seem to excite, like the opiates, any colliquative sweat.

It still remains to inquire, whether by the assistance of the prussic acid and of its marvellous activity, we might not hope to render the march of phthisis more slow, and even to cure it. But these questions, in themselves so important on account of the too fatal prevalence of the malady, cannot be decided by a small number of facts and experiments. they ought, on the contrary to be multiplied as much as possible, taking at the same time into consideration all the circumstances which might influence the results; and divesting ourselves of all sort of prejudice.

I am continuing my experiments on this subject, conjointly with M. Lerminier, at the hospital of *la Charite*, where, from twenty to thirty consumptive patients are habitually received; and I am in hopes to lay before the

academy, in the course of the next year, some facts worthy of their attention.

Some may consider it as a mark of temerity in me to suppose that phthisis may be cured, when so many very eminent authors look upon it as absolutely mortal. But admitting that pthysis be incurable, with reference to all the substances hitherto employed, and the experiments hitherto made for that purpose in the true spirit of truth and investigation, the same mode of reasoning cannot hold good with regard to new substances, remarkable for the energy of their action on the animal economy: besides, ought not the physician to direct his attention to the cure of such diseases as *pthysis*, *cancer*, *&c.* in preference to merely varying the treatment of such diseases as, from peculiar circumstances and their nature, terminate always happily, whatever be the remedy suggested by fashion or caprice?

I shall now relate two cases in which there is reason to presume that pthysis was checked in its progress by the use of prussic acid.

CASE I.

A lady from Lyons, now residing in Paris, of a constitution eminently bilious, after having experienced several misfortunes, was in 1814, attacked by all the symptoms which characterize phthisis in its first stage. Circumstances not allowing her to attend to her health, she neglected it until within the first

months of 1815, when the disease having made great progress, she consulted me: I found her labouring under all the symptoms of the second stage of tuberculous consumption, with a cough returning incessantly, and a slow continued fever preying upon her and undermining her existence. The prussic acid was recommended, and taken at the dose of from six to ten drops in twenty-four hours, diluted. This acid had been prepared by Mons. Planche, by a new process which I shall hereafter describe. The remedy was continued for about two months. From the first day the cough diminished, the patient slept, and without pushing the dose higher than ten drops in the 24 hours, all the symptoms of the disease disappeared, the breathing became natural, the cough, expectoration, and sweats ceased. In short the lady was perfectly cured, and has never since experienced any symptoms which indicate the least disposition to a relapse. Her lungs, only, have become very sensible to the influence of atmospherical variations.

Must we conclude from this fact, that a consumption in its second stage has been cured by the prussic acid? I am far from thinking so; for I know with how much reserve we ought to draw any general and positive conclusion. Yet such as it is, and with all the importance attached to it, I submit the case to the practitioners, who take an interest in the progress of science.

CASE II.

An English lady aged 28, tall, and of a weak constitution, with a chest transversely ample, but narrow, was frequently subject to colds from her infancy. Last year, while crossing over from France to England, she was attacked by an inflammation of the lungs, with acute pain of the left side of the thorax, and spitting of blood. Bleeding, blisters, and all the means usually adopted in such cases, were had recourse to, and she got well; but she continued to suffer from a short dry cough, of no great intensity during the day, but which became greatly exasperated in the night. Several means were employed in England to check it, with no success. Believing that the climate of France might prove more beneficial to her health, she returned to Paris about four months ago. In spite of the fineness of the season, and residence in the country, the cough made considerable progress; she became uneasy and alarmed; and I was sent for about the middle of September last; when after a mature examination of all the preceding circumstances and her actual state, I did not hessitate in considering her as labouring under the first stage of pulmonary consumption. I prescribed the prussic acid, prepared by M. Planche, in the dose of 8 drops in three ounces of water in 24 hours. She has continued it ever since, and is at this day taking it.

Her cough has nearly vanished altogether; she has gained considerable *embon point;* and she considers herself at this moment as quite recovered.

Far be it from me to suppose that this is another instance of pulmonary consumption cured by the prussic acid. Yet it must be confessed that if examples like the two preceding ones were to become numerous, nothing could then prevent us from hoping, that we may at last have found a substance capable of arresting the progress of one of the most desolating maladies by which humanity is afflicted.

I shall conclude with a few words on the mode of preparing the prussic acid. If it be prepared in the way directed by Scheele, we run the chance of obtaining it at various degrees of concentration—a circumstance which ought by all means to be avoided. M. Planche, one of the most distinguished *pharmaciens* of Paris, follows a method which renders its preparation less uncertain. Instead of drawing one fourth of the produce by distillation, as the illustrious Swedish chemist first suggested, he stops the operation as soon as $\frac{1}{6}$ of the produce has passed into the receiver. He next rectifies the liquid thus obtained by means of a gentle fire, over $\frac{1}{200}$ of carbonate of lime, and draws off $\frac{3}{4}$ only of the whole by distillation.

Thus prepared, the prussic acid is certainly far from possessing the activity of that

prepared by Gay-Lussac; but it has more energy than that of Scheele, and above all, it has an *invariable* energy; since, according to M. Planche, it is always at the same degree of concentration. It also affords one other advantage, that of being susceptible of preservation, if kept in a cool place, equally removed from the influence of air and light.

I have also employed in many cases the acid prepared according to Scheele's method, and have not been struck with any difference in its action, (such as the theory of chemical doctrine seems to suggest) whenever I have taken care to get it at the houses of our best chemists.

The observations in this Paper are,

1st. That the pure prussic acid is a substance eminently deleterious, and altogether unfit to be used as a medicine.

2dly. That the prussic acid diluted with water is beneficial in cases of chronic and nervous cough.

3dly. That this same acid may be useful in the paliative treatment of phthisis, by diminishing the intensity and frequency of the cough and in procuring sleep, &c.

4thly. That there is reason to hope that this same substance may become advantageous, as a curative treatment of pulmonary phthisis, particularly when in an incipient state.

It was my earnest desire, in publishing these researches nearly three years since, to draw the attention of practitioners to a subject which appeared to me worthy their consideration. My desires have been gratified beyond my expectations. The faculty of medicine of Paris have placed the prussic acid in the list of medicines recommended by the new codex, and many French and foreign physicians have not only repeated my observations, but have even extended them far beyond the point to which I had myself carried them. I proceed then with satisfaction and gratification to communicate the results obtained by my fellow practitioners.

In a pamphlet entitled " : Description of the chicken-pox which prevailed epidemically with the small-pox in Milan 1817," Doct. F. Philiber Fontenelles expresses himself thus, (p. 21.) " I have obtained wonderful effects from the prussic acid prepared by the method of Scheele, in 4 children of the same family attacked with the hooping cough ; I put three drops of this acid into one ounce of distilled water, and I gave a spoonful of this mixture every two hours ; the children themselves related ingenuously that having commenced the remedy in the morning, they had had in the evening none of those attacks of coughing which threatened to suffocate them, that they had slept well, and that the fourth day from commencing the use of this liquid the hooping cough had entirely disap-

peared in two of them, and in the two others some days later.

" What gave me the idea of employing the prussic acid in hooping cough, was the perusal of a memoir of Magendie, which announced the success of this remedy in the nervous cough. Considering the hooping cough as having its seat especially in the nerves of the mucous membrane of the lungs, I thought of imitating this physician. I do not cite facts enough to prove that this acid is particularly useful in this disease ; but I request my fellow practitioners to repeat the experiments which I have made, to determine whether we can employ this substance generally."

The inaugural thesis of Doctor J. A. Manzoni, sustained at Padua 1818,* contains many very curious observations on the good effects of prussic acid in diseases of different natures : these observations are nearly all derived from the practice of professor Brera.

" A woman, aged 29, of a florid complexion, of a sthenic and irritable constitution, was brot to the clinical institution of Padua, without having yet received any relief, although she was in the 7th day of a very severe attack of a pleuro-peripreumony. Ten ounces of blood were at first drawn, a little after eight ounces were also taken ; 30 drops of prussic acid in an emulsion of gum ara-

*De precipuis acidi prussici et aquæ cohobatæ Pruni Laurocerasi medicis facultatibus observationibus comprobatis. J. A. Manzoni, 1818.

bic were prescribed and taken during the day, and twelve others during the night; the day after, the urine became abundant and sedimentous, after which the expectoration diminished, the respiration became more free, the cough less fatiguing, and the pain in the side ceased gradually. Thus by a simple and mild method of treatment this disease was cured in a few days. Dr. Manzoni asserts also in his thesis that the professor has derived the greatest advantages from the use of prussic acid in inflammation of the bronchiæ catarrhs and phthisis. I transcribe his own expressions: "In some other thoracic affections, in bronchitis, and catarrhs, which assumed a very inflammatory character, Professor Brera employed the prussic acid to oppose their farther progress, and to prevent their termination in a chronic inflammation of the lungs. The professor led by this double indication, employed this remedy in tubercular phthisis, in which there is a continual series of phlogistic processes.

He gave to a patient of this kind thirty four years old prussic acid in an emulsion of gum Arabic, and thus stopped the inflammation, which repeatedly showed a tendency towards tubercles, and prolonged the poor man's life; for the quantity of expectoration was diminished, and there was an improvement in the pus, which derived its origin from tubercles which had supurated before the patient entered the clinical institute.

A similar amelioration has been obtained, by the same means, in two females affected with chronic catarrhs tending toward phthisis. In both the expectoration was copious and puriform; but after using the prussic acid it diminished much and became only a simple mucus. These two women left the clinical institute almost perfectly recovered.

Professor Brera has observed the same facts in his private practice. Among many analogous cases is found the memorable example of a noble lady affected with incipient phthisis; she was taken with an hemoptysis so abundant, that she was soon near expiring; bleedings were used in vain, Dr. Brera then prescribed 100 drops of the prussic acid in the form of pills, to be taken during the night, which, according to his expression miraculously arrested the hemorhage. The use of the acid in the dose of thirty to fifty drops in twenty four hours was continued fifteen days, and this woman was perfectly cured without any trace of pulmonic affection remaining. The treatment of pulmonic diseases is not the only point towards which Professor Brera has directed his researches; another disease, the most cruel and implacable of all maladies, (cancer,) has been treated with advantage, in some cases, by prussic acid. A woman tormented at once by a schirrus uteri and a syphilitic affection, was treated at the clincial institute by the prussic acid and the leaves of atropa

belladonna, and was entirely cured of both diseases. A noble lady, aged 27 years, of an irritable temperament, came to Padua to be treated by Dr. Brera for a chronic affection of the uterus. This affection was characterized by the most acute pains at the fundus uteri, and by a mucous-purulent discharge from the vagina. The os-tincæ presented to the touch a heat greater than natural, and a very great number of inequalities; the menses appeared irregularly. At that period a most intense uterine colic happened resembling a true hysteritis with violent fever. To these symptoms were added a great constipation and hemorrhoidal tumours from which she had suffered a long time. On the second day of the disease this lady was taken with an uterine hemorrhage such as she had never before experienced; none of the usual remedies in such a case were of advantage. If the hemorrhage diminished ever so slightly, the pains of the uterus and the hemorrhoids became intolerable; and on the contrary if the severity of the pains seemed to be calmed, it was feared that the patient would sink under the hemorrhage; so great was the prostration of strength and the weakness of the pulse. In this difficult conjuncture professor Brera gave ten drops of prussic acid, in the form of pills, every hour, and advised to continue them till they had a marked effect on the vital forces. Scarcely had twenty drops of the acid been taken, when irregular

palpitations, great anxiety and vertigoes were manifested. Dr. Brera then ordered the use of the acid to be suspended, and its place supplied by a simple infusion of chamomile. A little time after, the skin, which hitherto had been dry and ardent, was covered with an abundant sweat, the pains of the hemorrhoids and the uterus disappeared, the hemorrhage was arrested, the constipation removed, the urine became abundant and sedimentous, and the patient was soon in a state of convalescence. She felt no pain now in the uterus, the puriform discharge became serous, the neck of the uterus no longer offered too elevated a temperature, and the inequalities yielded gradually to slight injections of prussic acid.* It results also from the observations of Drs. Borda, and Brera, who employed the prussic acid about 1810, in Italy, in sthenic diseases, that this substance is one of the best we can employ in calming the activity of the motions of the heart, in diminishing febrile irritation, and combatting violent inflammations. Dr. Manzoni affiirms that observations of this kind are now very numerous in Italy. Finally Prof. Brera has remarked that prussic acid was of great advantage in expelling lumbricoides, which are extremely common at Padua, and are complicated with most of the diseases at the hospital. The use of the acid expells them very speedily, and while yet living from the intestinal canal. I shall not indulge in any reflections on the

* Brera. Prospetii Clinici.

various observations of professor Brera. I shall only observe that the form of pills, to which this learned physician seems attached, appears to me one of the most defective for administering the prussic acid; for the great volatility of this substance does not permit it to remain a long time confined in the mass of pills, particularly when the temperature is a little elevated: this is doubtless the reason why the dose could be carried to one hundred drops in twenty four hours without any sensible injury.

After having analysed the thesis of Dr. Manzoni, I ought to speak of a work written professedly on the prussic acid which has recently appeared in England.*

It is from the pen of Dr Granville who has been a witness to some of the experiments which I have made with this substance. I shall extract the most important part of it, the facts.

I find there first some cases in which the prussic acid has sensibly ameliorated the state of many advanced pthisical patients, although as we should expect the disease has not been cured. But I remark there also two observations in which the disease appeared to have been arrested in its progress.

A young man and a young woman presented themselves at the gratuitous consultation Dr. Scudamore, with all the appearances of

* Further observations on the internal use of prussic acid, London, 1819.

confirmed phthisis: they both experienced a fatiguing cough, emaciation, very frequent pulse, nocturnal sweats, loss of strength, purulent expectoration, and that particular form of the nails which usually accompanies these various symptoms. The Doctor gave to both the prussic acid, in the dose of 10 drops a day, and had the satisfaction of obtaining the best effects from it. These two patients perfectly recovered and thought they had no longer any need of continuing the remedy. After an interval of eight months, the young woman returned to see Dr. Scudamore and thank him for her perfect cure.

Effects of prussic acid on the hectic and sympathetic cough.

Charlotte Pearce entered the general dispensary of Westminster with a continual and intense cough, with which she had been affected two years. She has experienced, for some time a chronic pain in the liver, and as far as we can judge by external examination, this organ is tubercular and adheres in many points where it should be free. After having suffered from a violent cough for more than a year, a hectic fever was developed, with two daily exacerbations, flushing of the cheeks, and night sweats. The expectoration was irregular, sometimes thick and abundant, sometimes almost wanting and entirely mucous. With these symptoms, there was loss of appetite, loathing of animal food,

and very great weakness. The acid was given by the advice of Dr. Granville, in the dose of eight drops ; and the cough was so visibly affected, that the night of the second day, she had 6 hours of uninterrupted sleep without a single moment of coughing, which had not happened for nearly ten months. Her appetite was completely restored during the time necessary to take about one hundred drops of the acid ; and at the end of six weeks, although her side was still and perhaps always will be more or less painful, her lungs appeared much less influenced by the morbid state of the liver. She coughs now very little, and without fatigue.

Mrs. Goodby, aged forty years, living in Marshall Street, Golden square, had experienced a recent abortion, and lost her husband at the same moment. Her mind and body were thus equally affected : she kept her bed, being very weak from a considerable hemorrhage ; finally, she had a continual fever, cough, anorexia and suffered much from watchfulness ; she appeared disposed to become phthisical : her friends considered her in a state of consumption. My opinion was not such ; I thought on the contrary that after having recovered her strength lost by abortion, the disease would assume a more favourable aspect. I determined on treating the cough as sympathetic and depending on a large malignant ulcer on the right leg, which occurred in consequence of an erysipelatous

inflammation, for which she had consulted Mr. Hutchison. I proposed consequently to this lady the prussic acid in the ordinary way. The cough was considerably diminished by the second day ; the patient began to recover her strength, and left her bed in a state of satisfactory health. The ulcer of the leg continues to the moment of my writing ; it is sometimes inflamed, and when this happens, the cough appears night and morning, but then a simple dose of acid produces the most advantageous effect in calming it instantly.

Sarah Buck, aged 34 years, resident in Ogle Street, has experienced an affection of the ovary of the left side ;—for about ten months since she has felt a continual pain in the left hypochondrium, shooting occasionally through the abdomen ; she gradually wasted away, and had a continual fever ; an extremely fatiguing cough began soon after, and the pulse indicated a sympathetic consumption. The means I succesfully employed to remedy the disease which produced all these symptoms, need not be repeated : but the cough did not diminish ; this is the reason why I resolved to combine the acid with the means already in use. She began to take it the 15th January and at this day, 12th February, she is entirely freed from the cough and the symptoms attending it. During the use of this remedy, there has been

scarcely any expectoration and no oppression of the breast.

I give now two observations of Dr. Scudamore addressed to Dr. Granville, with these words:

" I have the pleasure of addressing to you two cases in which I have used this new and powerful agent with the greatest success.

A young woman, aged 20, tall and delicate, subject to a cough during winter, was attacked with typhus in the month of August 1818; the most alarming symptom was the appearance of sub-inflamation of the brain, when the debility induced by the fever on the 19th day gave itself much uneasiness. These symptoms were a considerable redness of the vessels of the conjunctiva, brilliancy of the cornea, strange expression of the features and attitudes, a violent delirium at intervals, the pulse frequent and very hard. Two bleedings in the arm, one of six ounces, the other of five, were made in twenty four hours; leeches were applied to the temples; cold affusions on the head, and other means which it is useless to repeat here, were employed with doubtful success; however the danger was not obviated, and convalescence appeared only after one month from the first attack of the disease: at this period, a cough began to appear, and became by degrees extremely intense; it returned with the paroxism of a hectic fever, twice in twenty four hours; it was followed by an abundant trans-

piration. All the known means were employed against this cough and the hectic fever which threatened the unhappy patient with a speedy death. I prescribed then the prussic acid in doses of 8 drops in twenty four hours. Six days after we abandoned all the other remedies, and we gradually augmented the quantity of the acid to 24 drops in twenty four hours. By degrees the frequency of the pulse diminished, the expectoration, which was copious and puriform, was lessened and disappeared at the end of three weeks; the hectic fever had ceased after about ten days, so that in the interval of three weeks, and by the effect of the prussic acid alone, the patient recovered her health sufficiently to go and complete her convalescence in the country. She continues in good health to this day, she has recovered her strength and flesh.

A young gentleman, aged ten years, tall and delicate, was attacked with a fever which took at first the continued form and which then became nearly remittent. This disease was indeed troublesome by the extreme variation of the symptoms: at first the brain was apparently threatened with symptoms of inquietude, the expression of the countenance was not natural, the head was painful and warm to the touch, there was delirium; the pulse varied from one hundred to one hundred twenty six, there was great prostration of strength, the tongue was dry and fuliginous. The head was relieved after a

week of proper treatment ; soon respiration, which had been nearly always oppressed, became very alarming, and a cough which before was insignificant became continual and very intense. The pulse augmented : seven ounces of blood were drawn from the arm, which was continually covered with cups, till the blood presented a commencement of the buffy coat ;—this gave a moment of relaxation ; a blister was then applied to the left side, which had been many times indicated, as that side was a little painful. Two days after the imflamation of the lungs was still augmented, and respiration became more frequent. The child was pale and emaciated, the pulse feeble, the debility was so great that cups were still preferred to general bleeding ;—seven oz. of blood were drawn by this means with a manifest advantage ; however the relief was of short duration, and there was developed a certain hectic febrile state, not as regular as in the preceeding case. Here, there was a sensation of cold followed by heat on the skin and flushing of the cheeks twice in twenty four hours. The sweats were excessively abundant : we could not procure any of the matter expectorated it was so scanty.—A second blister was applied without any profit ; in this conjuncture as the lungs presented certain symptoms that called for bleedings which were however forbidden by the alarming general debility, to relieve the patient from the fever,

we resolved to give the prussic acid.—We began by four drops in twenty four hours. The body was washed twice a day with tepid vinegar and water. The surface of the blister was covered with some cerate. Asses milk at discretion, with cream and a little bread, formed the regimen. The temperature of the apartment was agreeable. The dose of the acid was gradually carried to eight drops. The third day of using this remedy, weakness, accompanied with general coldness, and complete dilatation of the pupils, obliged us to suspend the use of the remedy ; but the symptoms having disappeared at the end of three or four hours, we returned to it, because it had evidently diminished the cough, induced a refreshing sleep, slackened the rapidity of the pulse, and diminished the sweats. When we had used the remedy for fifteen days, we began to diminish its dose, and soon we discontinued it, when all the signs of convalescence were developed, and the breast was perfectly free.—In this last case, we employed the prussic acid, only because we found no other means of relieving the patient."

Asthma, Spasmodic and dry cough, Hooping cough.

Mr. H. of a very advanced age, has been affected with an asthma about six years. At the approach of each winter, his disease takes an alarming character, respiration becomes

very difficult, the oppression augments by the least exercise, or by the impression of a cold or humid air. The attacks do not return at fixed periods; during their intermission, he is tormented by a dry and continual cough, which leaves no moment of repose during the day, and deprives him of sleep during the night. When in this condition, he loses his appetite, he cannot take the lightest aliments into his stomach without an immediate aggravation of the symptoms of his disease. The secretions and excretions are very irregular; the last are often totally suspended. There is a tendency to an œdematous swelling of the legs, with shivering; the pulse is good in the morning, at which period of the day he feels best; it acquires frequency towards noon, and is decidedly febrile and irregular in the evening: at the same time the respiration becomes sufficiently difficult to excite convulsive motions. This deplorable state of extreme irritation, has been calmed by the use of the prussic acid. Mr. H. now coughs but rarely, he has recovered some sleep, the changes of weather are less hurtful to him; he can take some exercise, and ascend the stairs without experiencing oppression. According to his own expressions, he feels much better than he has done for a long time. In the case which I relate, the prussic acid has produced no debilitating effect: the patient has found so much relief from its administration, that on

the least recurrence of his complaint he wishes to have recourse to it, and I have been obliged to warn him of the danger that would result from the immoderate and unreasonable use of this medicine.

There is no disease more common in England than what is called a simple cold, without any special and determinate affection. An indisposition so slight in itself, does not deserve, (if we believe many persons,) any treatment; but if we consider that a simple cold when neglected becomes very fatiguing, and often takes on the character of a serious disease, we shall be compelled to acknowledge the utility of every means which shall have the effect of very speedily arresting colds. Such is the prussic acid.

Miss H. of a strong constitution, and enjoying good health, was taken with a catarrh from exposure to cold; she coughed and expectorated a little. By taking some precautions, Miss H. believed she would soon be freed from this slight affection; but she did not at first give attention to it; and her cough continued during many weeks. To put a stop to it, she had in vain recourse to all the usual remedies in such circumstances. She derived from them scarcely any advantage: mild emulsive drinks, expectorants, and different preparations of Ipecacuanha were tried in vain. Having heard of the good effects of prussic acid in a case of sympathetic cough related in this work (observa-

tion 3d,) the patient proposed to me to employ it; I willingly consented. I prescribed the prussic acid in a convenient vehicle; so that she took five to eight drops in thirty hours. I continued to use it only for a week; for, at the end of that time, the cough, which was calmed by degrees, had totally disappeared. It has not since returned.

I have had numerous occasions, at the dispensary of Westminster, to use the prussic acid with the greatest advantage in cases similar to the preceeding. I shall cite only the following observation:

Sarah Roberts had been pregnant about five months with her eighth infant. She had for five months also been fatigued by a violent convulsive cough, for which she consulted me. I soon perceived all the danger of her situation. Struck above all by her extreme irritation, I determined to administer the prussic acid with every proper precaution. I gave at first only some drops of it, and I watched its effects. It did not fail to lead to the most happy results: I saw the patient again some time after; she was entirely freed from her cough, and enjoyed perfect health. It is well to remark that her state of pregnancy did not at all influence the action of the medicine.

I shall cite, as a last example of the good effect of the prussic acid, an observation made by myself on my own children.

About two months since, they were at-

tacked by a very violent cough, almost continual, and manifesting itself by fits sufficiently violent to make us believe it the hooping cough. My eldest daughter was first attacked from exposure to cold ; two days after, my third child then in very good health took the disease from her sister ; the evening of the same day the second was equally affected ; and finally the fourth, still at the breast, was soon attacked by it.

The cough was very violent, and did not quit them day nor night. Vomitings sometimes happened as crises of the cough ; the tears flowed abundantly, the face was flushed, and they complained of a severe head ache. This disease had thus all the appearances of hooping cough : only one caracter was wanting, viz. the stridulous inspiration. There was no fever, except during the night, after attacks of coughing for many hours ; as their situation during the first days, presented nothing alarming, I was satisfied with letting nature take its course. However, the cough augment ing instead of diminishing, and the determination of blood to the head during the fits of coughing, augmenting more and more, I determined to relieve nature, which seemed of itself insufficient. My perfect confidence in the benificent properties of prussic acid, engaged me to employ it, and I had soon cause to felicitate myself for doing so ; about a week after I had commenced its use, the cough had entirely ceased, and has not returned since.

A catarrh of the nature of that I have just described, approaches singularly the regular hooping cough: a similar remedy might therefore be employed against it. Guided by analogy, I have combatted five or six affections of this kind by the prussic acid, and always with success. In one case only, the cough did not yield to the use of this remedy; but let us remark that the patient was a feeble and emaciated child, still convalescing from the small pox and the scarlet fever, which it had had a few weeks before. From the observations I have collected on the use of prussic acid in the hooping cough, and into the detail of which it seems to me useless to enter, I believe I am right in concluding that employed properly and seasonably in this affection, the medicine can abridge its duration and mitigate its symptoms.

Letter of Dr. Thomson, author of the London Dispensatory, to Dr. Granville. Sloane Street, February 20th 1819.

Sir

In conformity with your request, I send you the results of my experience relative to the medicinal properties of the prussic acid. I intended to have joined to them the recital of some physiological experiments made on animals: But I could as yet send you only an imperfect account; for, since I have began them, I have perceived that the plan which

I had traced extended more and more, and that consequently the whole of these experiments could not be finished at the period of the publication of your work. Since 1815 the memoir of M. Robert published in the Annales de Chimie in October 1816, and translated by me in the London Medical Repository, had fixed my attention on the action exercised by the prussic acid on the animal economy. However I did not think of employing it as a medicine till 1817, after having heard of the memoir of M. Magendie, which you translated at a later period into the Journal of Science and Arts. Since that period, I have prescribed the prussic acid in a great number of cases with variable success: the advantage which I have derived from it is sufficient however to authorise me to point out this substance as a very useful medicine, which ought to find a place among the most powerful sedatives.

The prussic acid introduced into the stomach, acts evidently on the circulatory system by means of the nerves:—it diminishes the action of the blood vessels considerably; it destroys it sometimes entirely, when given in too strong a dose. I have never remarked that its effects, eminently sedative, were preceded by any excitation; a circumstance which distinguishes it from all other substances which belong to the class of narcotics. M. Orfila and other authors think that it is rapidly absorbed and transmitted into the

torrent of the circulation, and that its effects are more or less prompt according as the circulation is more or less active. The truth of this opinion is rendered doubtful by the instantaneous manner in which it produces death, when it is given in a strong dose without having been dissolved. Its absorption is no better proved by the impossibility of discovering by the aid of reagents any trace of prussic acid in the stomach of the animal which has been killed by this poison ; indeed, we scarcely know the reagents proper to detect the pure prussic acid. I have proved by experiment, that the sulphate of iron, which detects its presence when it is mixed with some other substance or when it is in the state of prussiate of potash, produces no blue precipitate when we pour it on the pure prussic acid ; we cannot produce this precipitate any better by adding to the mixture a solution of potash.*

However it may be, the sedative influence of prussic acid on the nervous system, even when it is greatly diluted, is indisputable : I determined then to try it as a remedy, after the experiments of M. Magendie.

The diseases in which I have prescribed the prussic acid, are catarrhal affections ac-

* The only means of discovering the presence of prussic acid in the liquid which we suspect contains it, is to pour upon it some spirit of wine and potash, then to add a solution of sulphate of iron containing some drops of muriatic acid, or some neutralized tincture of iron.

companied with cough, and chronic coughs. I believe I have also derived some advantage from it in a case of hemorrhage ; but as I have only a single observation on its utility in this case, I shall not draw from it a general conclusion.

I have used it with very great success in catarrhal affections, which prevail epidemically in the country I inhabit. The disease begins by shiverings, which are soon followed by a febrile movement, by sneezings, hoarseness, thirst, and a laborious cough, which comes on by paroxysms, is more frequent during the night, and deprives the patient of sleep ; the tongue is loaded, the belly constipated, and the expectoration very difficult. Since I have employed the prussic acid, I have had recourse to bleeding only in a very few cases, although it seemed indicated by the state of the pulse: but I have abandoned its use from knowing the action exercised by the prussic acid on the circulatory system. I begin ordinarily by purging the patient, then I administer the acid, dissolved in some distilled water or a simple almond emulsion : I take care to proportion the doses to the age and strength of the individual, gradually augmenting the quantity till the cessation of the cough. In adults, I have begun by giving two drops of it in a spoonful of the vehicle, taken every two or three hours. For children between four

months and a year, I have prepared the following formula:

R. prussic acid, two drops; distilled water, three fluid ounces; syrup of tolu, one fluid dram. Mix them and take of the mixture two tea spoonfulls every third hour. The strongest dose in which I have ever administered this acid, has been twenty four drops in a day for an adult, and six drops for a child.

The first and most prompt advantage which I have obtained from the use of prussic acid in catarrhal affections, is to restore sleep, and to render the fits of coughing less frequent. The following day we find the pulse less active and less hard, and the cough becoming gradually less violent. I have not remarked that it promoted expectoration; but it certainly diminishes the cough and above all renders it less laborious. The intestinal canal is greatly excited; so that I have been very rarely obliged to give purgatives a second time. We easily remedy, by the moderate use of some stimulants, the languor which sometimes follows the use of prussic acid in feeble and aged persons; and when the cough is calmed, we are sure to dissipate it by using an ammoniacal tincture of iron, dissolved in some brandy and water.

I send you only one observation, chosen from among those I have collected in the catarrhal epidemic, which I have already men-

tioned ; for they are all similar.* I have joined to it some other observations, to show the good effects of the prussic acid in affections of a different kind, which we regard generally as very difficult to treat with success.

OBSERVATION I.

Mr. S. employed in the controller's office, aged thirty seven, of a plethoric constitution, and enjoying habitually good health, came to consult me for a very fatiguing cough, which had tormented him many weeks. He rarely enjoyed any moments of sleep, on account of the violence of his fits of coughing, which became more and more frequent ; he had at the same time a considerable soreness in the throat, great hoarseness, the breast was free from pain, the respiration short, and slightly sonorous. The patient had taken without success gruel, honey and other remedies of that kind.

After having been purged, Mr. S. was put on the use of prussic acid, in the dose of two drops in twelve drams of water, repeated every two hours. On the first night he enjoyed more repose, the cough had diminished in force and frequency, the expectoration had become more easy, the pulse had lost its

* In this epidemic I have had occasion to prescribe the prussic acid to twenty individuals. I have observed that in children who have been the most severely attacked, it was necessary to precede the administration of the prussic acid by a bleeding and a slightly stimulant purgative.

hardness, and at the end of three days all the symptoms of the disease were quieted.

It is well to observe that Mr. S. did not keep his chamber nor change his ordinary way of living: he only abstained from wine, because he had ceased to use it as well as all fermented liquors, since the commencement of his disease.

OBSERVATION II.

Miss G. aged forty, of a sanguine and irritable temperament, and of a character naturally gay, was attacked two years since with that particular affection of the mucous membrane of the trachea, very well designated in its most advanced degree by the name of tracheal phthisis. She had been treated at the commencement of her disease, by the antiphlogistic method; she had derived so little advantage from it, that confiding no longer in the assistance of medicine. she followed no treatment in the course of the second year: she took some medicines only when her symptoms were aggravated. Her disease was besides characterized by a troublesome cough, a sense of dryness in the throat, momentary threats of suffocation, and a general inflammation of the fauces without swelling. These symptoms which were accompanied with fever and a great irritability, never ceased entirely; they diminished only by intervals, above all during the summer. However slightly the patient was ex-

posed to the cold, they reappeared with new violence : so she kept her chamber during all the last and present winter. As the condition of Miss G. grew worse and worse, I advised her to quit England instantly, and to go and live in warm climates.

I saw Miss G. very often ; I followed with care the progress of her disease. It was evident to me that, although many of her symptoms depended on inflammation of the trachea, some however ought to be attributed to the state of irritation of the nervous system. I was confirmed in this opinion by the state of the pulse, which was small, active, irregular, and presenting continual variations in relation to the state of the intellectual faculties. There were at the same time palpitations of the heart, and the little sleep which the patient enjoyed was never profound, and often agitated. I thought that the use of prussic acid was indicated, and I determined soon to try it.

January 26, I visited Miss G. and I found her in the midst of one of her attacks : she attributed it to the impression of cold. However she had not been exposed to the air ; she had quitted her bed chamber only to pass into a dining-hall whose temperature was sufficiently elevated. The coughing was more severe than usual, very frequent, and resembled that of croup ; suffocation was imminent, the heat of the skin ordinary ; but the pulse was small, quick, intermitting ;

the whole fauces presented a very intense inflammation; besides, they seemed as if furrowed with red lines, which appeared to be large vessels strongly injected. However there was no trace of swelling, either in the tonsils or uvula. I learnt that, in the morning, the patient had been purged with a certain quantity of castor oil. Finding the occasion favourable I spoke to her of a new medicine which I wished to make trial of; and after having made her promise to take it punctually, I prescribed it in the following formula:

R. prussic acid twelve drops; rose water, half a fluid ounce; syrup of poppies three fluid drams. Make a mixture of which a large spoonfull should be taken every second hour.

The day following I found her much relieved: she had not passed so good a night for many months; she arose without coughing, or experiencing any sense of heat or uneasiness in the chest; the pulse was more regular, less frequent and fuller.

The prussic acid was continued for four days: every time I augmented its quantity by two drops. The fourth day, the patient experienced nausea; and as her condition was considerably ameliorated, and the most severe symptoms of her disorder existed no longer, she wished to abandon the remedy. Since that day, Feb. 26, Miss G. has had no relapse; she is perfectly well, and looks up-

on the amelioration of her condition almost as a miracle, and believes herself completely cured. I am far from the same confidence; I think that the disease is only restrained in its progress, that it still requires a careful regimin and great precautions. Although the mucous membrane of the trachea is at present greatly disordered, still the efforts of nature may possibly be sufficiently powerful to restore it to a healthy state. In this case the use of the prussic acid will have happily seconded nature by diminishing the irritation of the nervous system.

OBSERVATION III.

Lieutenant colonel F. had been for many years attacked each winter with a spasmodic cough, which had resisted every means employed to put a stop to it.

Consulted by him this winter, I thought that the prussic acid might be useful to him. He took it in the dose of two drops in an ounce of water, repeated every two hours. On the third day of using this medicine, the dose of which had been successively carried to four drops, colonel F. perceived a great diminution in the frequency and the violence of the cough, he had recovered his sleep; in one word, he felt so well, that being on the point of returning to his regiment in Ireland, he requested me to give him his

prescription. It would have been useless to him, since the prussic acid is not yet found in any English pharmacopia; but I sent him a little vial full of this acid, pointing out to him the mode of using it.

OBSERVATION IV.

T. R....., tells of a feeble constitution, and subject to attacks of gout, had been tormented for a long time by a dispepsia, accompanied by a particular sensation of heat in the tongue, which was supposed to depend on the state of acridity of the stomach. The remedies which he had employed, and the regimen to which he had submitted, had restored the powers of the digesting organs; and finding his health as good as it could be in a man who had passed the middle age, T. R. ceased to have recourse to medicine, However, the sensation of heat on the tongue still continued, when he was attacked with the epidemic catarrhal cough. He took the prussic acid in doses of two drops, repeated every two hours; and in less than four days the cough diminished considerably, and even the heat of the tongue became less and finally disappeared. This symptom has not since reappeared.

As the tongue feels by sympthy the state of the stomach, perhaps the prussic acid, in this case, acted by diminishing the irritability of the secretory surface of the stomach,

and consequently by rendering less acrid the secreted juices, and restoring them to their natural state. We know that opium and other narcotics give speedy relief in cardialgia, depending on acidity of the stomach; but these substances soon cease to have any effect, and augment on the contrary the irritability of the stomach. If then the prussic acid produces a more permanent and no less efficacious effect, it is clear that we ought to recommend its use in dispepsia.

Such, sir, are the results of my observations on the use of prussic acid as a sedative. Whenever it has caused, either nausea, or a sudden prostration, I have discontinued it: I do not believe we ought to prescribe it anew in individuals in whom it has caused these symptoms. I think that it may be injurious in certain idiosyncrasies; for example it may produce urticaria in persons who are subject to this kind of eruption after having eaten bitter almonds. The best and most usual remedies have also effects entirely peculiar on certain constitutions. Prussic acid is without contradiction a remedy of the greatest energy; and employed by wise and enlightened men, it cannot fail of increasing the riches of the materia medica.

Anthony Todd Thomson.

NOTE.

On the use of prussic acid, by M. de Kerkaradec, doctor in medecine of the Faculty of medicine of Paris.

CASE I.

The first time that I employed it was in the beginning of 1818, in the case of a lady aged 40 who had been tormented for a very long time with a dry nervous cough, which attacked her five or six times a day, in very fatiguing paroxisms, lasting an hour or more, and which gave place, after many efforts, to a simple mucous expectoration, with which were sometimes mingled some striœ of blood.

The prussic acid, procured from M. Planche, was given in a potion composed of orange flower water, distilled water of lettuce and syrup of ether.

A great number of medicines had been previously administered without any success, the acid succeeded no better.

We should observe, 1st that I began with an exceedingly small dose; 2d I did not go beyond ten drops; 3d the patient often interrupted the use of it; 4th she never followed my advice with any exactness; 5th when I wished to increase the dose she complained of feeling pains in the stomach.

CASE II.

One of my fellow practitioners requested me to see a pthisical patient in the third degree, and to administer to her the prussic acid. I put twelve drops of it in a potion composed of orange flower water, syrup of marsh mallows, and ½ an ounce of syrup of Diacodium. The dose was a tea-spoon full every two hours.—The next day the patient complained that the potion excited her cough. Doubting this fact, I recommended perseverance; but, at the end of two days, the attendants assured me that at each spoonfull, there happened a very severe fit of coughing; I then abandoned the remedy and saw the patient no more, she died soon after.

These trials were but little encouraging; however I resolved to continue them the first opportunity.

CASE III.

Jean-Marie Delaplace, aged seven, living in Rue St. Martin, No. 54, was taken fifteen months since, with a constant, dry, very fatiguing cough, accompanied with pains in the left side of the breast, fever, &c. Leeches to the breast, the epigastric region, and the anus; epithems, potions, and anodyne drinks were administered, but without relief: the young patient remained three months in

this condition, after which she was taken with a very violent hooping cough, which lasted also three months : it was cured spontaneously.

After the hooping cough, the dry cough returned, and had lasted one month when I was sent for.

I found the patient in bed ; the cough was continual and without expectoration, the stitch in the side had returned, and the left side of the breast sounded wrong by percussion, the tongue was covered with a whitish fur, there was no appetite, constipation attended, the belly was tense, and a little sensible to the touch ; there was habitually a slight accumulation of the pulse, and, from the relation of the parents, there was in the day a very violent fever. The patient had besides a tendancy to stupor, and a very violent head-ache.

I applied to the chest eight leeches, and then emollient cataplasms. The belly was also covered with the same kind of fomentations. I prescribed at the same time mild juleps, drinks and clysters. These means procured a diminution of the symptoms above described ; but the cough always preserved its character. Then I added to a potion twelve drops of prussic acid of the manufacture of M. Vauquelin. The dose was a coffee spoonfull every two hours. The potion lasted three days, and at the end of this time the cough began to diminish. The patient

took also three potions, containing fifteen drops of this medicine ; this quantity was sufficient to cure him completely : he has not had the least relapse for seven months.

CASE IV.

At the same time, Eliza-Therese Henry, aged three years and a half, living in the same house, was affected with a hooping cough, which had lasted five months, its fits, very violent and very frequent (these were at least twelve a day,) were followed by a mucous expectoration, mixed with a very great quantity of blood.

I applied five leeches to the left side of the breast, which gave a more obscure sound than the opposite side.

The little patient was relieved ; there was now scarcely any blood mixed with the expectoration ; the fits of coughing diminished, in frequency and intensity.

I gave then, twelve to fifteen drops of prussic acid in a potion after the ordinary manner. After two potions, and in the space of twelve days the hooping cough had disappeared.

CASE V.

James Marie Henry, brother of the preceeding, aged nine months, and still at the breast, began also to cough, and the cough

seemed to take the character of hooping cough.

We gave him for eight days two coffee spoon fulls a day, of his sister's potion. The cough was arrested.

CASE VI.

Adrienne Pitre, aged four years and a half, Rue Neuve-St.-Merry, No. 47, had had a hooping cough for five months, for which they had administered without success all the ordinary remedies, particularly the syrup of ipecacuanha.

The prussic acid, procured from M. Colmet, apothecary, was administered as usual, in the quantity of fifteen drops for three days.

It was suspended for four or five days on account of a fever which lasted that time, we then resumed its use, and at the end of fifteen days I ceased to visit the patient, her cough had ceased.

I have learnt since, that fits of it had returned at distant intervals when the weather was humid : some baths caused it to disappear without returning.

CASE VII.

Miss R., aged twenty years, of a plethoric constitution, had her menses habitually regular, and the quantity of blood evacuated every month was abundant. These happened to her, without any known cause,

very acute pains in the stomach, to which was joined an almost continual cough, which returned by very violent paroxysms, but without any appearance of hooping cough.

As some in her family had had the gout, and as she herself had in her infancy felt some attacks of that complaint, I advised pediluvia impregnated with mustard, which were of no utility. I administered also some lenitives, slightly narcotic, antispasmodic drinks and potions.

I put her on the use of asses milk, all without success.

The length of the sufferings, and the obstinacy of the cough, made Miss R., uneasy, and she thought herself threatened with phthisis.

Her colour and flesh were altered.

I gave her twelve drops, a day, of the acid prepared by M. Vauquelin, in six tea-spoon fulls of edulcorated mucilage, of gum arabic.

At the end of some days the cough diminished sensibly.

Encouraged by this success, the patient took three drops of it to a spoon full, in all twenty one drops a day, and continued this dose for some time.

At this day Miss R., is entirely freed from her cough, and enjoys very good health. The pains of her stomach are rare and supportable.

Such is the written or printed intelligence which I have received relative to the medicinal effects of prussic acid:

The agreement which we may remark between the observations collected in various parts of Europe, by distinguished physicians, seems to me an irresistible testimony in favour of the happy advantages which this new medicine presents, and of its perfect safety, even in very strong doses, when it is administered with prudence, but without timoorus circumspection.

Whilst these facts were collected, I have not remained idle; I have neglected nothing to extend, confirm or invalidate the results which I have related in my memoir; but I have been particularly occupied with the effects of prussic acid in phthisis pulmonalis, as the point which presented the most interest, and where the difficulties to be overcome were the greatest.

I have administered the prussic acid, both in my private practice, and at the gratuitous consultation of the central burcau of the hospitals, to a very great number of phthisical patients more or less advanced, and I have seen, as well as in my first observations, the most fatiguing symptoms experience a sensible emelioration; the cough becoming much less frequent, the expectoration more free, the sleep more prolonged, &c.*

* M. Lerminier having experienced a very long indisposition, it has been impossible for me to continue my observations in the words of La Charite.

In a single case I have seen the prussic acid fail completely ; it was in a young and interesting person, wife of an apothecary of Paris. After a lying-in, she was taken with the first symptoms of phthisis ; in three months the disease ran through its periods without any remedies having appeared to influence its progress: the acetate of morphine alone seemed to diminish a little the burning fever, and the fits of coughing which consumed the patient.

It is doubtless highly worthy of all the interest of the physician to seek to render the horrible existence of the unfortunate individuals attacked with organic affections more supportable ; for medicine is as often the act of relieving as of curing. But how greatly will a remedy which shall successfully oppose the developement of phthisis influence the happiness of society ! how many tears, how much dispair will it prevent !*

I have not however entirely abandoned those hopes† which I had derived from the

* I do not pretend to say that, by this means we shall influence the total mortality, for its laws appear to be wholly independent of medicine ; but if it should not change the annual number of deaths, probably it will cause it to bear more particularly on an age in which the loss of life is less sensible to those who die, and above all more easy to repair for those who survive : it is sufficent to point out the first period of infancy.

† I indulge these hopes at present so much the more willingly, since Dr. Laennae has just published many histories of cures of

two facts related in my memoir. I have neglected no occasion of using the prussic acid in the first degree of phthisis, making every effort to dispel the illusions which surround the doubtful physician, who seeks to recognize the commencement of a disease reputed incurable.

My trials have not all been equally happy: in many cases I have had the pain of seeing pthisis continue its progress in spite of all the aids of the act, among which I have not failed to employ the medicine on the use of which I build my greatest hopes.

But it is with a satisfaction easily comprehended that I have seen the symptoms of phthisis completely terminated in seven different cases, in five children of four to six years, a girl of fifteen, another of twenty years, a young man of twenty five, and an old man of sixty six years; and it is with anxious solicitude that I watch their health, to know whether this disease is truly arrested, or only suspended in its progress. Time can only clear up this doubt I shall only observe that the two ladies, the subjects of the observations related in my memoir, and whose cure dates back four years, continue in perfect health. May those of whom I have just spoken, long enjoy the same advantage!

phthisis; cures confirmed by the examination which an accidental death permitted him to make. See de l' Auscultation mediate, Paris 1819.

In the various cases in which I have used the prussic acid, I have not confined the dose within the limits I judged necessary in my first trials ; I have on the contrary many times carried the dose gradually to half a dram in twenty four hours, without the least inconvenience resulting from it ; I have also observed that the effect of the prussic acid is very different in different individuals. In administering it we must then begin always with a feeble dose ; but we must not fear to raise it ; if the effects of the medicine are not manifested.

This work will I hope concur in proving that physiology, chemistry and medicine can be alied in the cause of humanity, above all if, we wish to obtain from this alliance what can really be derived from it.

NOTE.

Experience has convinced me that the prussic acid, prepared by the process of Scheele, has not sufficiently constant medicinal properties, on account of the liberty which the process leaves to the preparer. I prefer then, and I employ now the pure prussic acid, prepared by the process of Gay-Lussac, and diluted with six times its volume of distilled water, or eight times its weight of the same. The density of prussic acid is at 7° o, 7o583. That of water being unity ; six volumes of water for one of acid correspond with five of water and one of acid in weight,

since the weights are equal to the volumes multiplied by the densities.

The formulas I have most often employed are the following:

Pectoral Mixture.

R. Medicinal prussic acid, . . . 1 drm.
Distilled water . . . . . 1 lb.
Pure sugar . . . . . 1½ oz.

Make a mixture of which take a tea spoonful in the morning, one in the evening on going to bed.

Pectoral Potion.

R. Infusion of ground ivy . . . . 2 oz.
Medicinal prussic acid . . . . 15 drops.
Syrup of marsh mallows . . . . 1 oz.

Make a potion to be taken, by tea spoonful doses, every three hours.

Cyanic Syrup.

R. Syrup of sugar perfectly clarified . . 1 lb.
Medicinal prussic acid . . . . . 1 drm.

Mix exactly. We make use of this syrup to add to ordinary pectoral potions and supply the place of other syrups.

I have used the prussic acid in pulmonary consumption and asthma, in several cases since the paper of Magendie appeared in the Journal of the Royal Institution. In one case it has been used for eight or ten months with occasional intermissions. This patient

is a female of forty five, with fever obviously of the hectic kind, and irritating cough. She has occasionally expectorated blood ; yet it is thought there is no organic affection (ulceration) of the lungs. This patient and her friends have expressed much satisfaction in using the prussic acid. The fever has obviously been reduced and the cough much abated by the use of the prussic acid. At one period the acid was omitted for four weeks, when the fever and all the symptoms of phthisis returned. It was thought by the friends of the patient that she would have been cured if she had continued to take the acid during the period above specified. This patient is now using the acid.

ELI IVES, M. D.
Professor of Mat. Med. and Bot.
Yale College.

Extract from a letter from E. D. Smith, Professor of Chemistry, Columbia, (S. C.) to Dr. James M. Henderson, Raleigh (N. C.) containing the results of the practice of Dr. Davis of Columbia, with the prussic acid.

Having found in the 8th number of the Journal of the Royal Institution, (London) an interesting article upon the prussic acid, by Dr. Magendie, of Paris, I pointed it out to my friend Dr. Davis, and requested him to make trial of his new remedy. A small portion was procured from Charleston, having

been manufactured there by L'Herminier, an excellent French Chemist, who has since returned to the West Indies: but this being soon exhausted, no further supply could be obtained from thence, and I therefore undertook to make it myself, which I have now several times accomplished, according to the process of Scheele, recorded in Cooper's edition of Thomson's Chemistry, Vol. 2. p. 224, &c. observing this difference, that instead of distilling one fourth of the whole quantity of water used, I permitted but one sixth to pass over into the receiver. This process is somewhat tedious and complicated, but with the requisite chemical knowledge, and suitable apparatus, it may be conducted with accuracy and success. Thus much for the mode of supply. As to the nature of this substance, it is a most virulent poison, and in this respect you will recognize its analogy to some of our most effectual remedies—It would therefore require to be carefully kept from common handling, and also from the action of light, which is said to decompose it. The same result ensues from long keeping: for then instead, of its natural transparency, it exhibits a darkish hue.

An adult in using it, should commence with three drops of the acid, diluted with as many ounces of water, and taken in the course of twenty four hours—A gradual increase may be made to eight or ten drops, which is the largest dose that has yet been

used in this place. Our experience here is not more than of two months standing, and during that time Dr. Davis has prescribed the acid in eight or nine cases, all of which, as yet (with the exception of one) have been greatly benefitted. The unfortunate case was that in which it was first used, and was almost hopeless at the time; but, even in this, the distressing cough, copious expectoration and wasting hectics were for weeks kept at bay, and the patient so much re-animated as to induce a hope of recovery; but this finally proved delusive. At any rate, however it was the best palliative that had been used, and greatly abated the sufferings of dissolving nature. From the other cases it may probably be inferred that in proportion to the recent occurrence of the disease, has been the apparent benefit; and in no one case has the remedy produced injurious consequences. After some continuance, it appears to affect the breast with a sense of stricture, which is relieved by the distise for a few days, or by some discharge of blood from the lungs; or it affects the brain in a slight degree, soon removed, however, by a disuse of the medicine. The auxiliary treatment is much the same as with the use of other medicines—to keep the stomach and bowels clear, (although the acid in some degree performs the functions of a cathartic,) to avoid alterations of temperature and exposures, &c.

OBSERVATIONS

ON THE PREPARATION AND USE OF THE PRUSSIC ACID,

BY ALFRED S. MONSON, M. D.

NEW-HAVEN.

PRUSSIC ACID.

As regards the application of this article to the purpose of medicine, a great desideratum appears to be, a mode in which it may be prepared so as to possess uniformly the same strength.

The process of Scheele, or the modification of it by Planche, and indeed all others that have been proposed; appear in this respect objectionable.

The process of Gay-Lussac, may form an exception to this remark: but this is attended with more hazard to the operator, is less economical and far less convenient.

The process of Scheele, Planche, and others is objectionable, because the quantity of the prussiate of mercury formed, will vary with the quality of the articles employed in making it. The quality of the Prussian blue, and of the red oxyde of mercury, is by no means constant. The former varies in

strength, and purity, and the latter is sometimes adulterated with minium. By following precisely the process recommended by Scheele, I have obtained prussic acid of very different degrees of concentration, from those articles; and those which are sold in our shops for the best quality. But could they be obtained uniformly of the same purity, still if the ingredients are not sufficiently boiled, or well mixed, part of each will remain undecomposed.

Some difficulties, it is true, cannot be wholly obviated by any process hitherto discovered. Whatever means are made use of to decompose the prussiate of mercury, provided they are effectual, the strength of the product resulting from its decomposition will be ceteris paribus, proportional to the quantity of the prussiate employed. In order therefore to obtain prussic acid of uniform strength, it appears necessary that some mode be adopted, which shall not be influenced by the different degrees of purity in the articles, from the combination of which it is indirectly obtained.

The process of Gay-Lussac, provided a certain quantity of distilled water be placed in the retort, or receiver, or in both; would be less exceptionable for accuracy than for convenience.

A process I have adopted, which is a modification of Scheele's, will insure a good degree of uniformity in the strength of

the product. It moreover possesses the advantage of being effected with as little labour as any.

It is as follows.

Take any number of fluid ounces of a saturated solution of prussiate of mercury in distilled water of a given temperature: proceed with it nearly as directed in Scheele's process; distilling off any definite quantity.

For medical prussic acid, the following process will invariably afford that which possesses the strength of Scheele's when properly prepared from the best materials.

Pour into the retort, eighteen fluid ounces of a saturated solution of prussiate of mercury, at the temperature of 65° of Fahrenheit; add to it two ounces and an half of iron filings; pour upon these, two ounces by weight, of strong sulphuric acid, and distill off three fluid ounces into a receiver containing one fluid ounce of distilled water. The receiver must be surrounded with ice, and covered with a cloth to render it dark.

To get rid of the colouring matter, together with some sulphuric acid, and iron that come over, it may be redistilled from dry carbonate of lime.

A tubulated receiver is employed: this is connected with the retort by means of one or two adapters of common length; the junctures are made perfectly tight, a tube of safety leads from the tubulure of the receiver

into a little water, and a tube descends from the retort to the bottom of the receiver.

In forming the prussiate of mercury, I have observed, (and the same fact was noticed by Professor Silliman): that if only half as much of red oxyde of mercury as of Prussian blue be used as directed by Scheele, the whole of the Prussian blue is not decomposed and more of the prussiate of mercury is obtained, by adding more of the red oxyde and boiling them again.

To ascertain the precise quantity required to produce a saturation, I have employed several proportions. From these experiments it results that where the materials are of the best quality, two and a half parts by weight, of the red oxyde, to four of the prussian blue is the best proportion. I prefer using a larger quantity of water than is directed: to aid the mutual action of the prussian blue and of the oxyde of mercury.

The following experiments will show the strength of the prussic acid obtained in the above manner.

Experiment 1.—Three drops of this prussic acid were introduced into the mouth of a full grown cat. In one minute and a half she yelled heidously, ran clumsily across the room, and for ten minutes took no notice of objects around her. In thirteen minutes she appeared sleepy, and her respiration more hurried. In twenty minutes appeared nearly well: but as soon as she was libera-

ted, she lay down and slept eight hours; after which time she appeared as well as before the experiment.

Experiment 2.—A drop and a half were introduced into the mouth, of a pigeon; in half a minute it fell, and fluttered as if decapitated: and in two minutes it was dead.

Experiment 3.—A large cat, strong and fierce, was held and made to swallow ten drops of this prussic acid from a dropping glass. In less than fifteen seconds the animal fell, gave two or three dismal screams and breathed no more.

This animal was susceptible of electrical influence for twenty minutes. In thirty three minutes with the largest charge of electricity from a quart jar, I could discover no signs of muscular contraction whatever.

Experiment 4.—Two small drops were let fall into the mouth of a large rat: he appeared restless, and was set at liberty: he immediately fell on his side; arose, staggered, stood with his head nodding; scratched his throat with his fore paws; his eyes projected; he remained much in the same state for five minutes; but soon appeared better: and in twelve minutes shewing a disposition to escape, he was arrested and confined.

Experiment 5.—Four minims were introduced into the mouth of another rat. In twenty seconds he threw his head on one side, fell, experienced an emprosthotonos: his eye-balls projected; he urinated and expired in two minutes.

To the kindness of Professor Silliman, I am indebted for some of Scheele's prussic acid, prepared by Mr. Robiquet in Paris, and obtained through the good offices of Dr. Magendie.

From several experiments with this prussic acid, it appears to possess the same strength as that afforded by the process which I have suggested.

Ten drops of this acid were poured into the mouth of a cat: the animal leaped suddenly upon the floor; ran across the room; fell down; breathed but three times and expired. Electrical shocks were immediately passed through her: she manifested an uncommon degree of excitability for twenty minutes; after which time muscular contraction soon ceased.

In a number of experiments the effects produced on the same kind of animals and in others of different kinds, such as crows, pigeons, mice and insects, were very similar to those recited.

There was generally a paralysis of the posteriour extremities in quadrupeds, frequently a tetanic rigidity of the muscles, sometimes singultus, and commonly a palpitation of the heart.

It often produced on animals effects similar to those which follow sudden fright or rage: on birds a ruffling of the feathers, and on quadrupeds a horripilation, particularly on the back and tail. On all grown anim-

als, it appeared invariably to act with more energy than on the young of the same species.

Against the effect of prussic acid no antidote has been discovered. The most powerful stimuli have been proposed: that among these electricity will claim the first rank would appear probable from the following and other similar experiments:

To a large rat had been given so much of the prussic acid that he manifested a total asphyxia. In the course of half an hour, two hundred shocks of electricity from an eight ounce jar, had been passed through him. At the end of this time he was resuscitated, arose, ran across the room; appeared stupid for some time, but finally recovered.

The following cases are stated to exhibit the operation of prussic acid medicinally employed.

A lady of nervous temperament, affected with a convulsive cough, had taken the usual remedies for several weeks, but found no relief; she took prussic acid of the strength of Scheele's, five drops diluted with three ounces of cinnamon water, in the course of the first day. On the second day she took ten drops in the same vehicle, and the same on the third day. On the fourth she found her cough had left her; she omitted its use and her cough has never returned.

In a case of herpetic eruption on the hands, a solution of twenty drops in an ounce

of water, was used for a wash ; a tea spoonful at a time ; no benefit was apparent nor was any effect produced by it. A case of psora was removed by it but it returned ; recourse was had to it again, it was removed and did not again return.

Tooth ache A drop of prussic acid, diluted with an equal quantity of water, put in the tooth with some cotton wool gave instant relief.

A naevus which from a trifling bruise had taken on diseased action and become exceedingly painful, was much relieved by occasionally washing the part with some solution of thirty drops of prussic acid in one ounce of distilled water. In this case many sedative applications had been employed and all hopes of relief from any thing but extirpation were abandoned.

A lady affected with symptoms of catarrhal phthisis and fever bordering on hectic ; her pulse was from one hundred and twenty to one hundred and thirty in a minute. The prussic acid was given to the extent of ten drops in twenty four hours, diluted with two ounces of cinnamon water, and gradually increased to thirty drops in the same time ; the pulse was reduced only to one hundred ; expectoration appeared rather diminished. After continuing its use for some days the dyspnœa accompanying the complaint increasing, the remedy was omitted. The patient soon grew better, respiration easier

and the pulse did not rise again so high as before.

To an infant one year old labouring under a convulsive cough, a mixture consisting of six drops prussic acid in fourteen drachms fluid, was given in half tea spoonful doses every hour with directions to omit it if sleep supervened.

The paroxisms of coughing became far less frequent on the first day of its administration. Its use was continued until the above quantity had been taken with considerable, but not with the same relief as on the first day.

On the third day more of the same mixture was directed to be given in double the dose: the paroxisms of coughing had become most violent in the morning and evening; the strictest attention was paid to its administration; and on the fourth day the cough was nearly subdued and the patient in all respects evidently better; the necessity of my attendance was superseded.

Those who have never witnessed the powerful controul of prussic acid over the vital principle, may convince themselves of its efficacy by an experiment on any living animal. Experimental knowledge, thus acquired, will to those who administer it, insure the observance of greater accuracy and attention, and at some future period, may be productive of great improvement, in the science of medicine.

We sometimes see violent effects exerted on certain idiosynerasies by the most common medicines, such as opium, calomel, antimony, &c.; although as yet prussic acid has been more uniform in its operation than any of these; lest however such an effect might sometimes occur, the propriety of commencing its administration with minute doses will suggest itself to every enlightened practitioner.

ERRATUM.

Page 79—20th line from top for "*three* fluid ounces," read *half* &c.

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